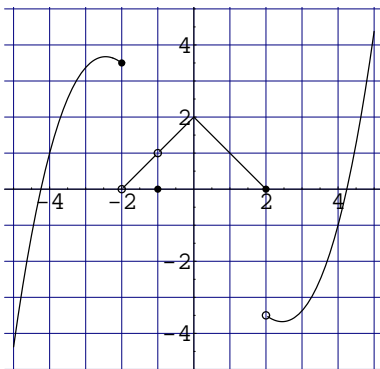


MATH 251 (PHILLIPS): WRITTEN HOMEWORK 3.

This sheet is part of the homework for Week 3, and is due in class on Friday 25 January 2008.

All the requirements in the sheet on general instructions for homework apply. In particular, show your work (unlike WebAssign), give exact answers (not decimal approximations; again, unlike WebAssign), and use correct notation. Some of the grade will be based on correctness of notation in the work shown.

1. For the function $y = f(x)$ graphed below, answer the following questions:



(a) List all numbers a in the interval $(-5, 5)$ such that $f'(a)$ does not exist. Give brief reasons for your choices.

(b) Which of the following best describes $f'(3)$? Why?

- (1) $f'(3)$ does not exist.
- (2) $f'(3)$ is close to 0.
- (3) $f'(3)$ is positive and not close to 0.
- (4) $f'(3)$ is negative and not close to 0.

2. Let $w(t)$ be the water flow at time t in a river at a particular measuring station. Assume that t is measured in days, and that $w(t)$ is measured in m^3/sec .

(a) What are the units of $w'(t)$?

(b) During the beginning of the rainy season, do you expect $w'(t)$ to be positive or negative? Why?

(c) Explain the practical significance of the statement $w'(t_0) = -27$ for a particular time t_0 .

3. Express the following statement in terms of calculus. Be sure to define everything that appears in your formulas.

“The average income of lawyers is decreasing.”

4. If $f(x) = \sqrt{x+7}$, compute the derivative $f'(9)$ *directly from the definition*. (If you have looked ahead, you can check your answer using the differentiation formula, but no credit will be given for just using the formula.)

Date: 21 January 2008.